Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

CŒLOSPORIDIUM BLATTELLÆ, A NEW SPOROZOAN PARASITE OF BLATTELLA GERMANICA.

(PRELIMINARY NOTE.)

BY HOWARD CRAWLEY.

The Malpighian tubules of the so-called Croton bug, *Blattella germanica* L., are the habitat of a Sporozoan parasite which apparently belongs to the Haplosporidia. This group, which has the value of an order, is divided into several rather poorly defined genera. The animal herewith described does not fit very well into the present scheme of classification, but for the sake of avoiding a needless multiplication of names, I shall accredit it to the genus *Cœlosporidium* Mesnil and Marchoux. The creation of a new species is warranted, whereupon, for the time being, the animal may be known as *Cœlosporidium blattellæ* sp. n.

The life cycle, so far as I have yet been able to trace it, originates as a minute cell of strongly acidophil cytoplasm, containing several granules of chromatin. These granules, which range around one micron in diameter, appear to have the value of nuclei, and they will be so termed in the description which follows.

At first the cell, or, to follow the terminology suggested by Minchin, the trophozoite, is generally somewhat longer than broad, and lies with its longer axis across the lumen of the tubule. The shape may be as shown in either fig. 1 or 2. One end lies against, and is apparently attached to, the lumen of the tubule. I have not been able, however, to determine the exact nature of this attachment. Neither in fixed nor fresh preparations were there ever seen any processes such as those of the epimerites of polycystid gregarines or the inert pseudopodia of Ophryocystis. The attachment seems merely to be a close apposition, and there is no objection to so regarding it. For in consideration of the narrow lumina of the tubules and the lack of fluid currents passing through them, the parasite is in little danger of being carried away. Certain appearances, however, suggest that the maintainance of the usual position is aided by the presence of an amorphous substance which lies

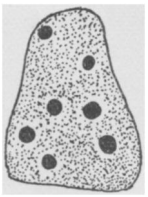

Fig. 1.

between the parasite and the host cell. It is often impossible, in the case of those small closely applied forms, to get a sharp line of demarkation between the sporozoan and the epithelium, the one blending with the other by imperceptible degrees.

However this may be, the juxtaposition of the parasite and the cell is evidently of no great importance to the former. Ordinarily the smaller, undeveloped stages are attached and the later stages free. The reverse may, however, be observed and the matter is evidently one largely of chance.

By a uniform growth in all directions the trophozoite becomes an egg or potato-shaped organism, reaching a length of around 20 microns. This, however, is to be noticed only in the free individuals and where the spatial relations are favorable. More usually the lumina of the tubules are so small and so closely crowded with the parasites that the latter are constrained to assume a vermiform or plate-like shape. Thus fig. 2, which is the longitudinal section of an indivdiual with a circular cross-section, would answer equally well for the cross-section of an individual extending for some distance along the tubule cells.

Fig. 2.

Both these elongated or flattened individuals, as well as the egg-shaped forms mentioned above, may still retain the primitive character of being naked masses of uniform cytoplasm with a various number of solid nuclei. Generally, however, the reproductive cycle is inaugurated while the organism is still very small. The first indications of this are furnished by the nuclei. These lose their spherical form and their solidity. They may become either somewhat irregular masses or else rings. The elements are so minute that the determination is difficult, but from what takes place later these early phenomena are apparently the expression of the breaking up of the nucleus into extremely small chromosomes.

Simultaneously there arises around each nucleus a vacuole, which, in its turn, can often be seen to be surrounded by a condensed belt of cytoplasm. These are the first steps in the breaking up of the trophozoite into separate elements, and from this point on development may progress along either one of two lines. In the one case the result is the production of what I shall call the "round bodies." In the other the process is clearly spore-formation. I have not yet succeeded in satisfactorily differentiating these two developmental courses in their

earlier stages, and the detailed account will be reserved for my final communication. I shall here merely consider the latest stages in each case.

Fig. 2 shows an acidophil cell still attached to the epithelium. Within it are several clear areas. Each of these is occupied by a quantity of chromatin. In several cases the manner in which this chromatin is arranged is strongly indicative of mitotic division. In fig. 3 is shown what may be called a cyst of the round bodies. The original trophozoite consists of a shell, divided into irregularly shaped compartments. Each compartment contains a completed round body. The round body is normally spherical; occasionally ellipsoidal. It usually consists of a solid mass of strongly acidophil cytoplasm containing an irregular nucleus. That the element shown in fig. 3 is derived from that of fig. 2 is indicated by the striking resemblance between the nuclei, and by their size. In the stage of fig. 2 the nuclei are in division, and are thus, as is usual, lying within clear regions. To obtain the conditions shown in fig. 3 it is only necessary to conceive the collection of the cytoplasm around the nuclei, with the consequent disappearance of the vacuoles.

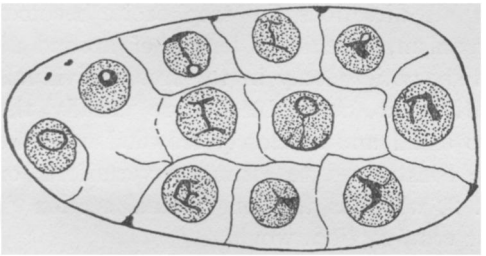

Fig. 3.

A little later, by the complete disintegration of the cyst, the round bodies come to lie free in the lumina of the tubules. They are minute elements, ranging in diameter from $1\frac{1}{2}$–2 microns. There is probably a very delicate ectosarc or membrane, since at times the cytoplasm is wanting, the chromatin lying within an otherwise empty shell. The ultimate destiny of these bodies has not yet been discovered.

The formation of the spores follows much the same general lines, but differs considerably in detail. The nuclei, after passing through the stage of individual chromosomes, concentrate into rings, ovals, or the so-called dumbbell shape (figs. 4 and 5). Frequently they may become wholly solid masses of chromatin, but more usually they show a central cavity, or, in the case of those having the dumbbell shape, two such cavities. Around this chromatin mass there is nearly always a clear space, while the bulk of the spore consists of a thick shell of acidophil cytoplasm (fig. 5). Occasionally the clear space encroaches upon

the cytoplasmic mass, which may thus become a thin shell, or even wholly wanting at the two ends of the spore. There is an evident

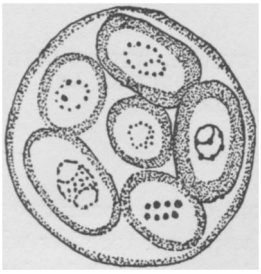

Fig. 4.

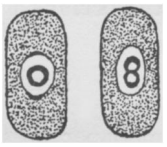

Fig. 5.

membrane or shell in the mature spore, the average length of which is 5 microns.

The reason for regarding these bodies as spores is the fact that they occur in the alimentary canal of the host, both before and behind the openings of the Malpighian tubules. In the former position they were seen to lie close against the epithelial cells, but none of my material showed any of them *en route* to entrance.

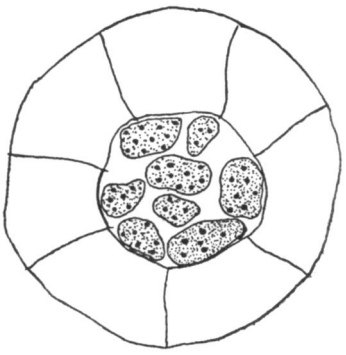

Fig. 6.

Perhaps the most striking phenomenon exhibited by this parasite is the abundance with which it occurs. Fig. 6 shows the cross-section of a tubule, wherein the parasites come near to occluding the entire lumen. This is a quite characteristic condition. It would seem that so complete a blocking up of the tubule should produce disturbances in the economy of the host. Yet the tubule epithelium was throughout, to all appearances, wholly normal.